PALATABILITY and NUTRITIVE VALUE of FORAGES

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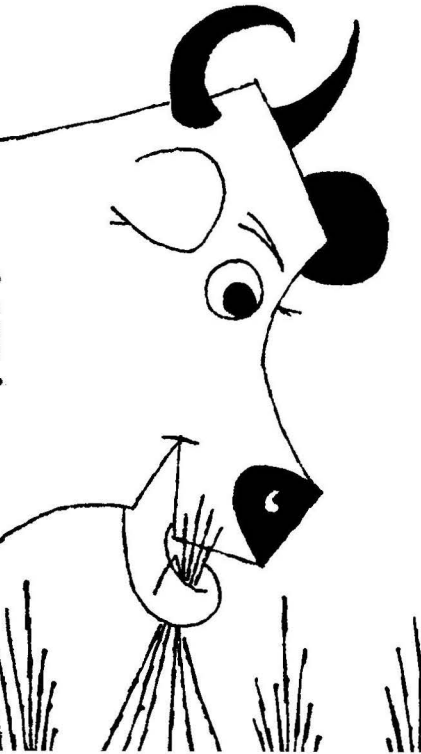

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Hawaii's ranges afford a wide variety of grass and legume forage for cattle. It is to the economic advantage of the rancher to familiarize himself with the relative values of each, together with certain basic factors which influence both palatability and nutritional value in these forages. Some of these factors are briefly discussed below.

The palatability of forage is very important in feeding livestock for efficient production of animal products. Animals consume a large amount of feed if the ration is palatable and well-liked. They will normally yield the maximum of product only on rations made up chiefly of palatable feed. And when feed is taken in in large quantity, milk production in dairy cows and meat in beef cattle are increased economically.

Often familiarity and habit are important factors associated with the palatability of feeds. Animals may, for instance, when first driven into a paddock of Kaimi clover or molasses grass, refuse to eat these plants. When they have become familiar with the taste, however, they may consume large quantities of both. An example of this was noted in several beef animals on a certain ranch in Kona, Hawaii, which at first refused to eat pangola grass, a palatable forage. Later, however, after a nitrogen fertilizer had been applied, the animals immediately took to the grass. It was a case of nutritive deficiency which, when corrected, made the grass attractive to the animals.

Forage intake often depends on the coarseness of leaves and stems. Animals usually avoid plants with stiff and harsh leaves in preference to the more succulent ones. Stems are in general coarser than leaves, so a high proportion of leaves in relation to stems is usually associated with the more palatable species. In napier grass, it was found that the greatest amount of palatable forage was produced by cutting every 8 weeks, while the greatest amount of protein in the palatable portion of forage was produced by grass cut at 6 and 8 weeks of age. Another factor affecting palatability is the obnoxious nature of some plants, such as the bitter taste in sour grass (*Trichachne insularis* (L.) Nees) and the disagreeable odor in pikake hohono (*Clerodendron fragrans* Vent.).

Study has shown that the chemical composition of forages varies widely, depending on their stage of maturity and soil fertility. The study has received a great deal of attention in temperate countries during the past 30 years, although comparatively little work has been been done in the tropics.

An experiment on the response of kikuyu grass to nitrogen in applications of 100, 200, 400, and 800 pounds of ammonium sulfate per acre, conducted at the Haleakala Branch Station of the University of Hawaii Agricultural Experiment Station, indicated that the increase in green forage, dry matter, and protein per bag of ammonium sulfate was greater for each increment of fertilizer used. The yield of dry-matter in plants was increased a great deal and the chemical composition of the plant was influenced. Thus it can be seen that the use of fertilizer, with adequate moisture, is an excellent way of raising the forage yield and nutritional value of a plant. Farther, it can be noted that certain fertilizers, such as nitrogen, for instance, make the forage more palatable.

Young grass demonstrates a relatively high protein and low fiber content.

With the approach of maturity, however, the percentage of protein declines and the fiber content increases.

In general, the leaf of a given species is richer in digestible nutrients, vitamins and minerals than the stem. Fagan and Jones working in Wales, stated that the leaf portion of the plant is distinctly richer than the stem, and an understanding of the relative proportions of these parts will prove a fair guide to the nutritive value of a forage plant at any period of the year.

Thus we see that both the stage of growth and grazing management practices can have an important influence on both the chemical composition of the plant, and the palatability appeal to animals of the plants affected.

Ranchers, often ask about the relative palatability and nutritive value of forage plants because they know there are differences in protein content and yield between the different species. This may be accounted for in several ways. Schofield, for instance, states that under the same soil—climatic conditions, certain species possess the ability to make more effective use than others of soil nutrients in the elaboration of protein. This is perhaps a principal reason for the differences which can be noted.

This circular has been prepared to help farmers and ranchers recognize certain important factors in forage value. The protein content of a plant is a good indication of its nutritive value, although the chemical analysis alone is of little practical use in assessing the nutritive value of grasses. Often plants with high nutritive value are low in palatability and are of little value as forage. A table presenting the average percent protein content of the principal forage plants of Hawaii is given in green roughage and dry weight basis. Species whose chemical composition has been determined and published in available literature are reported here. And the *relative palatability* of the different species at near-mature stage is presented in four categories as excellent, good, medium, and poor. This was determined by observing, under different soil and climatic conditions, the animal preference to forage species in grazing plots and on the open range.

Further information on forage value of given plants may be obtained from the University of Hawaii Agricultural Extension Agent in your district.

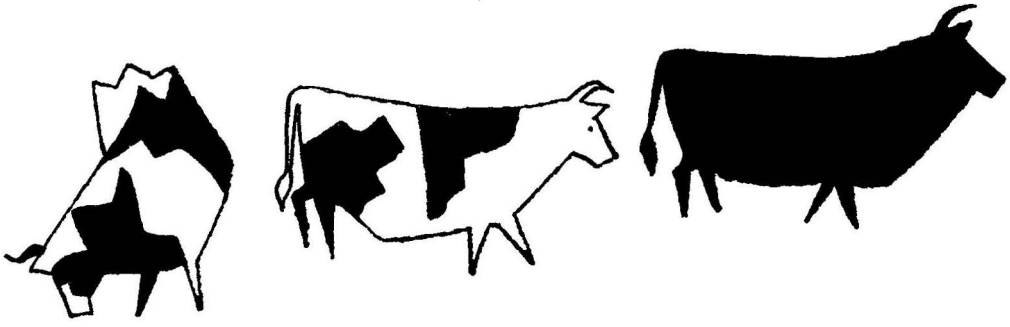

TABLE 1. Average protein content and comparative palatability of the principal range plants of Hawaii[1].

Common Name	Scientific Name	Crude Protein Green Weight Basis	Crude Protein Dry Weight Basis	Palatability
		Percent	Percent	
GRASSES				
Australian saltbush	*Atriplex semibaccata*	3.7	15.8	med.
Bahia	*Paspalum notatum*	2.4	8.0	med.
Bermuda	*Cynodon dactylon*	2.8—pasture	11.2	excel.
Blue panic	*Panicum antidotale*	—	11.6	good
Brome	*Bromus catharticus*	5.0—pasture	17.3	good
Buffalo	*Stenotaphrum secundatum*	2.7—pasture	14.9	med.
Buffel	*Pennisetum ciliare*	—	11.4	good
Cactus	*Opuntia megacantha*	0.4	7.4	med.
Carpet	*Axonopus affinis*	2.3—pasture	9.2	poor
Guinea	*Panicum maximum*	1.2	4.5	good
Harding	*Phalaris arundinacea*	4.3—pasture	17.1	excel.
Jaragua	*Hyparrhenia rufa*	—	7.3	poor
Kentucky Blue	*Poa pratensis*	5.5—pasture	18.2	excel.
Kikuyu	*Pennisetum clandestinum*	2.0	8.1	med.
Kukaipuaa	*Digitaria sanguinalis*	2.7	9.4	good
Mesquite	*Holcus lanatus*	—	4.9	good
Molasses	*Melinis minutiflora*	1.3	3.3	med.
Napier	*Pennisetum purpureum*	1.0	4.7	good
Orchard	*Dactylis glomerata*	3.5	12.7	excel.
Pangola	*Digitaria decumbens*	—	9.9	good
Panicum	*Panicum purpurascens*	1.8	6.4	good
Paspalum	*Paspalum dilatatum*	3.8—pasture	12.0	excel.
Pili	*Heteropogon contortus*	—	4.8	med.
Red Top	*Agrostis alba*	2.9	7.4	med.
Rhodes	*Chloris gayana*	1.7	6.7	med.
Ryegrass	*Lolium perenne*	3.0	11.3	excel.
Sudan	*Sorghum vulgare*	1.9	8.1	good
Sugar cane top	*Saccharum officinarum*	1.4	6.1	excel.
Sweet Vernal	*Anthoxanthum odoratum*	4.4	20.0	med.
Tall fescue	*Festuca arundinacea*	3.7	12.3	med.
LEGUMES				
Alfalfa	*Medicago sativa*	4.1	20.5	excel.
Birdsfoot trefoil	*Lotus corniculatus*	3.7	14.8	excel.
Black medic	*Medicago lupulina*	4.5	13.9	excel.
Bur clover	*Medicago hispida*	5.1	24.4	good
Dwarf koa	*Desmanthus virgatus*	4.1	11.3	poor
Florida beggarweed	*Desmodium tortuosum*	4.2	15.5	good
Hop clover	*Trifolium procumbens*	4.5	17.5	excel.
Kaimi Clover	*Desmodium canum*	—	14.2	good
Koa haole	*Leucaena glauca*	6.1	18.8	excel.
Kudzu	*Pueraria thumbergiana*	5.5	17.9	good
Kudzu	*Pueraria phaseoloides*	—	17.3	good
Pigeon pea	*Cajanus cajan*	5.4	12.3	excel.
Red clover	*Trifolium pratense*	4.0	16.3	excel.
Spanish clover	*Desmodium uncinatum*	4.2	13.5	excel.
Subterranean clover	*Trifolium subterraneum*	—	19.1	excel.
White clover	*Trifolium repens*	5.1	28.6	excel.
White sweet clover	*Melilotus alba*	4.1	19.1	med.
Yellow sweet clover	*Melilotus indica*	—	20.3	good
Vetch, common	*Vicia sativa*	3.8	18.8	excel.

[1]Where information is available, the results are expressed both as percent of the green or freshly cut material and as dry weight. "Pasture" are young plants having higher protein content than more mature plants.

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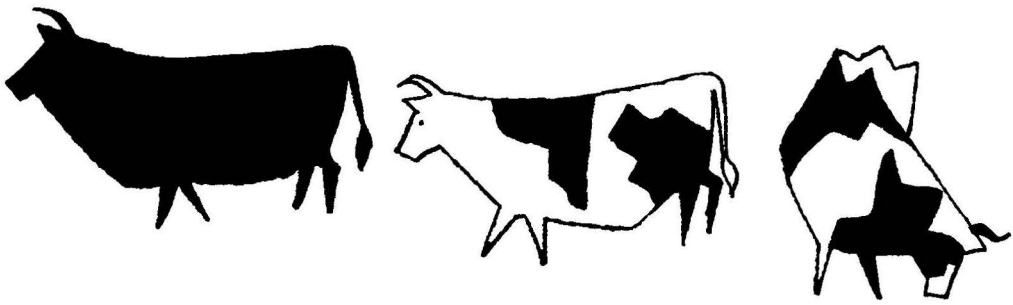

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